

in the youngest shoots, enclosed, as before, in a double layer of epidermal cells.

The author has traced the development of branches from this axis. They are given off from single exogenous wedges in a very peculiar but eminently exogenous manner, the details of which are given in the memoir. But, besides these, other clusters of vessels are given off which have no exogenous development or radiating arrangement. It is not yet clear what these secondary vascular bundles signify.

The author points out the general resemblance between this development of the detached exogenous wedges and that of the 4-partite woody axes of the Bignonias of Brazil, demonstrating at the same time their very marked differences.

Though no traces of leaves have yet been discovered in connexion with these stems, the author has very little doubt that they belong to some Lycopodiaceous plant. The nature of the vessels and the simplicity of their arrangement alike indicate cryptogamic features, at the same time that their mode of development indicates, with remarkable distinctness, that we have here another example of that exogenous mode of development of which the author has already described so many modifications amongst the fossil stems from the Coal-measures. The occurrence of this physiological process of exogenous growth in a stem which, when matured, was little more than one tenth of an inch in diameter, shows that its occurrence is not merely a question of the size of the plant, as some have supposed, but that it has a deeper meaning, and corresponds more closely than has been supposed with the exogenous developments seen equally in large and small examples of living plants.

MISCELLANEOUS.

On a new intermediate Type of the Subkingdom Vermes (Polygordius ?, Schneider). By M. EDMOND PERRIER.

THE study of intermediate types becomes of more and more importance in proportion as one knows more of the organization of the creatures constituting the great primary groups of the animal kingdom. The number of these types, formerly very limited, becomes every day greater as the means of investigation and the naturalists devoted to the study of the organization of animals become more numerous. The subkingdom Vermes has proved particularly fruitful in this respect, so much so that, besides the great classes that every one knows, it has become necessary to create small classes to receive some creatures still completely isolated in existing nature—such as the *Sagitta*, *Balanoglossi*, *Polygordii*, and many others. I had the good fortune at Roscoff, in the products

of the dredgings organized by M. de Lacaze-Duthiers at his experimental zoological laboratory, to meet with one of these intermediate types undoubtedly very nearly allied to the singular animals for which Rathke and Schneider created the genera *Rhamphogordius* and *Polygordius*, but most resembling *Polygordius* by its posterior extremity. To avoid the creation of new generic names, I shall designate it *Polygordius Villoti*. I choose this specific name in memory the fine memoir of M. Villot on *Gordius*, to which Schneider, in the following phrase, has so singularly compared the animals in question:—"It may be said that the *Polygordii* are annulated *Gordii* in the same sense that the *Lumbrici*, the *Eunices*, and the *Hermelle* may be regarded as annulated *Ascarides*."

This, as may be seen, does not imply a very close relationship. Nevertheless the author of the 'Monographie der Nematoden' employs expressions which might, in this respect, lead to error, especially where he speaks of *Polygordius* as a Helminth, without giving notice, otherwise than in a table of classification, that he gives the name of Helminthes to the subkingdom or, as the transformists say, the whole stock of Vermes.

In fact the *Polygordius* which we examined at Roscoff is distinguished from allied animals by its length, which is more than one decimetre, while the *Polygordius lacteus* and *purpureus* of Schneider only attain a length of about ten millimetres. The diameter of our animal is hardly a millimetre in the middle region of the body; it becomes thinner towards the anterior region, which terminates by bifurcating so as to form two little horns, about one millimetre in length and slightly widened at their base. The body likewise becomes attenuated behind, where it terminates in an obtuse point, which appeared to be destitute of the papillæ characteristic of *Polygordius purpureus*. Our species is of a flesh-colour, darker in the female, lighter and as it were milky in the male, at least near the time of sexual maturity. The sexes are separated in these animals, as in the greater part of the Nemertians and Annelides, which they approach in many respects, although they cannot be placed in either of the two groups. The agility of these worms is extreme: their cephalic region is constantly in motion; and they bury themselves and travel with remarkable ease in the coarse sand in which they live, and where they are found in company with *Dentalium* and *Amphioxus*, at depths from which the dredge brings up also *Terebratulina caput-serpentis*, *Solaster papposus*, *Palmpipes membranaceus*, and particularly a charming species of *Zoanthus*, which comes unluckily to invalidate a result which has lately been a little prematurely advanced before the Academy. Notwithstanding its great vivacity, *Polygordius Villoti* is one of the most fragile of animals; it breaks with great facility, and often spontaneously, when we try to preserve it in captivity, so that speedily no more is left than a small fragment of the anterior extremity. This property is in connexion with the partitioning of the general cavity.

Outwardly the body does not appear to be annulated; the mouth is inferior, a little way from the anterior extremity of the body,

and of a triangular form; the part of the body which extends before it may be regarded as a cephalic lobe. The eyes are wanting; but there exists on each side, about the level of the mouth, a vibratile pit of oval form, and of which the greater axis is vertical. These pits, the immediate neighbourhood of the mouth, and a small part of the posterior extremity are the only exterior parts of the body which present vibratile cilia. By this character the *Polygordii* are removed from the Nemertians, in the same manner as they are removed from the Annelides by the complete absence of locomotive setæ.

The cuticle is thick, and presents, as in the greater part of the Annelida, a double system of striæ distinctly inclined to one another; and at the interlacing of a great number of these we see the orifice of a tube perforating the cuticle, and which is only the excretory tube, of small clear glands of diverse forms, and situated in the subjacent layer corresponding to the hypoderm of the Annelida. In transverse sections the striated cuticle seems to be formed of a number of superimposed layers. The *hypoderm*, besides the glands which it contains, is clearly decomposable into beautiful polyhedric nucleated cells. Below the hypoderm there is a layer of transverse muscles, of which the perfectly distinct annular fibres are disposed in a single plane. According to Schneider, this layer is absent in the *Polygordii* that he examined; and it is on this fact that he bases the approximation that he has proposed between *Polygordius* and the Nematoids. Beneath the muscular layer the longitudinal muscles are found disposed in thin radiating lamellæ, stretching almost to the intestine, and in no point resembling the muscular bundles of the greater part of the Annelida and *Lumbrici*. In this there is, in fact, something which slightly reminds us of what is seen in several Nematodes; but this is the only point of resemblance that it is possible to find between the animals now under consideration and the parasitic worms. In a transverse section we see all along the median ventral line a thickening, which at first seems to be continuous with the hypoderm, but which a more minute analysis shows to have a more complex constitution. I have reasons for believing that this is the nervous system; but it is a point that requires further investigation. From the summit of this thickening two partitions, symmetrical with respect to the vertical plane, start obliquely, inclined eighty degrees to each other, and ending laterally at the integuments. These partitions extend through all the extent of the ring; and as another vertical partition binds the intestine to the integuments along the median dorsal line, the general cavity is divided more or less completely into four longitudinal chambers. Transverse vertical partitions also divide it into rings completely separated from one another, and identical with the rings of the Annelida.

The digestive tube presents no special glandular appendages; it has neither trunk nor gizzard, only in the neighbourhood of the mouth two lateral longitudinal folds playing the part of lips. It is constricted in passing through the interannular partitions, so as to

present the moniliform aspect so frequent in the Annelida. In this region it is surrounded by a sort of muscular sphincter belonging to the septum; elsewhere it presents the ordinary longitudinal and transverse muscular coats. Its internal epithelium, of a green colour, is very strongly vibratile throughout its whole extent from the mouth to the anus. The circulatory apparatus is composed of a dorsal vessel bifurcating in front at the level of the vibratile pits, but also emitting a little lower down two oblique branches directed forwards and joining the vertical branches resulting from the bifurcation. In each ring the dorsal vessel emits a lateral loop; and all these loops seemed to me to terminate in a median ventral vessel. The vascular apparatus of *Polygordius Villoti* is therefore more complicated than that of its congeners, in which there is no ventral vessel and the lateral loops terminate caecally.

The genital elements are developed on the walls of the body and of the longitudinal partitions in all the rings behind the first four or five. They are free in the general cavity, where in the males the tails of the spermatozooids may be seen floating and stirring about like a sort of vibratile lining, when the heads are still united in a single group soldered to the walls of the cavity. The heads of the spermatozooids are pointed at the pole opposite the tail; they afterwards swell out into a sphere, and then enlarge a little, so as to form a sort of disk, from the centre of which springs the tail. Spermatozooids of this form have been figured in some Annelides. The ova have a vitellus of an orange colour, and often several germinal spots; they cause the female to be of a more decidedly reddish colour than the male. The evacuation of the products of generation is effected by the intermediation of segmentary organs, which are but little folded upon themselves, and vibratile throughout their length.

By these various characters *Polygordius Villoti*, as may be seen, approaches very near to the Annelida; but the absence of locomotive setæ, and the presence of vibratile pits on each side of the head, would tend to approximate it to the Nemertians, from which, however, it is excluded by the absence of vibratile cilia on the integument and the distinctness of the septation. I see no character which justifies at all clearly the approximation of *Polygordius Villoti* to the Nematodes.

I propose to resume shortly the researches which I have commenced on this interesting type; their results will appear in the 'Archives de Zoologie expérimentale' of Professor de Lacaze-Duthiers.—*Comptes Rendus*, April 26, 1875, p. 1101.

On the Development of the Spinules in the Scales of Gobius niger (Linn.).

By M. L. VAILLANT.

The theories admitted by anatomists with regard to the origin of the spinules may be divided into two principal ones: either these processes result from simple notchings of the posterior margin of the scale, and being calcified with the lamella are only a dependence